

New Product Introduction Process and Competitive Benchmarking with Special reference to Caterpillar 40/50T Off-Highway Trucks

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Abstract

Technological innovation is one of the principal determinants of business success. New product development is one of the most important components of product policy and product management. Product lines and products are appraised and are positioned effectively. For a higher level of growth, a firm has to look beyond its existing products. A progressive firm has to consider new product development as a cardinal element of its product policy. A business firm has to respond to these dynamic requirements of its clientele and these responses take the shape of new products and new services. Through such a response, the firm reaps a good deal of benefits. New Product Introduction is the process adopted by organizations worldwide to develop products and services for customers. Organization employees, suppliers, dealers and customers are involved throughout the process. Based on the Caterpillar New Product Introduction Framework and Competitive Benchmarking, the research objectives of the study are confined to evaluate the adherence of process steps in each of the phases of New Product Introduction framework; to plan and build prototype and pilots of the new model of trucks and evaluate the performance of the truck(s); and to carry out Production Studies of the new model of trucks with the competitor machines and generate Production Study data to substantiate the advantages of the new trucks over the competitors. The results of this study determines how systematic adherence of New Product Introduction process at Caterpillar for the introduction of 40/50 ton rear dump trucks has paved way for the successful production launch of its products and how Caterpillar 40/50T products were subjected to competitive benchmarking with similar class products of competitors and emerged superior over competitors with regard to product performance and reliability. This study is related to the adherence of the New Production Introduction process and the results of the production studies to place the new product in the market. It is based on predetermined objectives and methodology. In the process of study, the objectives are pre-determined. The methodology has been designed to fulfill the objectives for the study.

Key Words: Competitive Benchmarking, New Product Introduction, Production Study, Product Launch.

1. Introduction

Technological innovation is one of the principal determinants of business success. New product development is one of the most important components of product policy and product management. Product lines and products are appraise and are positioned effectively. Brand decisions are taken wisely. For a higher level of growth, a firm has to look beyond its existing products. A progressive firm has to consider new product development as a cardinal element of its product policy.

Innovation is the essence of all growth. This is especially true in marketing. In an age of technological advancements, change is a natural outcome – change in food habits, change in expectations and requirements. Any business has to be vigilant to these changes taking place in its environment. People always seek better products, greater convenience, newer fashion and more value for money.

A business firm has to respond to these dynamic requirements of its clientele and these responses take the shape of new products and new services. Through such a response, the firm reaps a good deal of benefits. New products become necessary from the profit angle too. Products that are already established often have their limitations in enhancing the profit level of the firm. Profits from products decline as they reach the maturity stage of their life cycle. Thus, it is necessary for business firms to bring in new products to replace old, declining and losing products.

New products become part and parcel of the growth requirements of the firm and in many cases, new profits come to the firm only through new products. New products can be broadly classified into two groups: new products arising out of technological innovations and new products arising out of marketing oriented modifications. The first group involves innovations leading to intrinsically new products with a new functional utility behind them. The second group involves mere marketing oriented innovations in existing products; it gives rise to new versions of the existing products.

The new-product introduction world has changed dramatically. No longer can brands wait for an annual convention to showcase their wares and impress supermarket buyers. With the competition for shelf space at an all-time high, brands must reach out to retailers proactively, rather than hoping they will stop by their booth — no matter how lavish.

2. Need for the Study

Products manufacturers are under increased pressure to grow revenues and improve operating efficiency. Challenges in meeting growth targets include changes in consumers' demographics, increased competition in mature markets, increased spending on services, the rise of private labels and the low success rate of new brands. We are definitely entering the era of innovation. It is pervasive. It is influencing the way in which companies think about virtually every aspect of research, marketing product development, supplier and materials management, manufacturing, distribution, warranty and defect management, maintenance repair and overhaul, and product end-of-life and disposal. Innovation is global. Innovation knows no boundaries. Its growth is being nurtured by active investments, grants and tax incentive policies of established, industrialized nations and emerging economies. Put in the context of the era of innovation, the "perfect product launch" and lifecycle management are now viewed in a different and expanded way.

3. Concerns in Introducing New Products

Why do so many new products fail? Usually for many reasons. Companies often are so enamored of their new product ideas that they fail to do their research, or they ignore what the research tells them. Sometimes the pricing or the distribution channels are wrong. Sometimes the advertising doesn't communicate. Successful product launches result from an integrated process that relies heavily on research and solving up-front issues. Let's review several of the critical issues that affect product introductions.

Market research

Market research is the key. Without the necessary information, you're simply flying blind in a storm, headed for a crash landing. Market research does more than confirm your "gut feeling," it provides critical information and direction. It identifies market needs and wants, product features, pricing, decision makers, distribution channels, motivation to buy. They're all critical to the decision process.

Timing

Are all elements of the process coordinated? Is production on the same time schedule as the promotion? Will the product be ready when you announce it? Set a time frame for the rollout, and stick to it. Many products need to be timed to critical points in the business cycle. Miss it, and invite failure. There are marketing tales galore about companies making new product announcements and then having to re-announce when the product lags behind in manufacturing. The result is loss of credibility, loss of sales, and another failure.

Capacity

If the new product or service is successful, do you have the personnel and manufacturing capacity to cope with the success? Extended lead times for new products can be just as deadly as bad timing.

Testing

Test-market the new product. Be sure it has the features the customer wants. Be sure the customer will pay the price being asked. Be sure the distributor and sales organization are comfortable selling it. You may need to test your advertising and promotion as well.

Distribution

Who's going to sell the product? Can you use the same distribution channels you currently use? Can you use the same independent representatives or sales force? Is there sufficient sales potential in the new product to convince a distributor, retailer, or agent to take on the new line? There are significant up-front selling costs involved in introducing new products. Everyone in the channel wants some assurance that the investment of time and money will be recovered.

Training

Your sales organization, inside employees, and distribution channels will need to be trained about the new product. If the product is sufficiently complex, you may need to provide face-to-face training. Or perhaps some type of multimedia program will do the job. If the product is not that complex, literature may work. Again, timing is critical. Train before the product hits the shelves, not after.

Promotion

Finally, you need the promotional program to support the introduction: advertising, trade shows, promotional literature, technical literature, samples, incentives, Web site, seminars, public relations. Time it all with production, inventory, shipments, and training. The new product will simply sit in the warehouse without the right support materials. These are some of the myriad issues you face in launching a new product or service. Research, timing, and planning can all help increase the probability of success.

4. Statement of the Problem

Caterpillar, Inc. USA, is the world largest and leading manufacturer of construction and mining machines, diesel and natural gas engines and industrial gas turbines. Caterpillar products and components are manufactured worldwide.

Caterpillar India Private Limited (CIPL) is a 100% subsidiary of Caterpillar, Inc. USA. CIPL manufactures Off-Highway dump trucks, front end loaders, hydraulic excavators and backhoe loaders. These products are used in open cast mining, quarrying, irrigation, steel plants, cement plants, power plants in the field of construction and material handling.

With the growing prospects in the Emerging market and to establish Caterpillar’s Worldwide market leadership Off-Highway Truck group needs to launch a worldwide platform for the 40/50T to address both emerging market and developed market needs by providing our customers the best value proposition at a fair price. To address the pricing sensitivities in emerging markets it would be beneficial to leverage the lower cost of producing the emerging markets offering at the CIPL plant. The study scope addresses key customer, business, and regulatory requirements by delivering content that creates value, generating stockholder wealth.

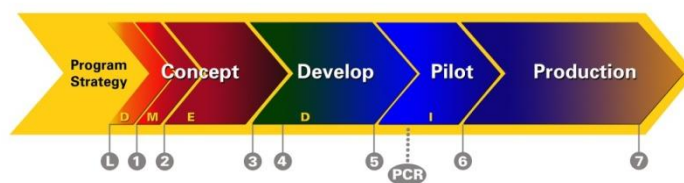
Product Description / Content

The primary machine changes that provide these deliverables are:

- One Worldwide Platform – One WW Design & one WW Process
- Lower O&O cost by providing best in class serviceability.
- Improved Shift Quality
- Improved Economy Mode
- Tire Protection
- Improved TCS & Lines Routing
- Improved Operator comfort
- Weight & Cost Reduction

New Product Introduction (NPI) Framework

Figure 4.1 – New Production Introduction phases



As per Figure 4.1, NPI Framework consists of eight phases

- a. **Program Strategy** → Launch Review
- b. **Concept – Define** → Gateway 1
- c. **Concept – Measure** → Gateway 2
- d. **Concept - Explore** → Gateway 3
- e. **Develop - Design** → Gateway 4
- f. **Develop - Verify** → Gateway 5
- g. **Pilot** → Gateway 6
- h. **Production** → Gateway 7

Competitive Benchmarking

Competitive Benchmarking is the “Production Study” carried out by the OEM by comparing its class of its product to the similar class of product of the competitor. This will necessitate establishing the advantages and positive selling features with respect to performance over the competitor machines in the market. The 2 major factors of comparison are Fuel Consumption and Productivity. The positive selling features include lesser fuel consumption per hour and higher productivity measured in Fuel/Ton ratio.

5. Objectives of the Study

Based on the earlier mentioned New Product introduction Framework and Competitive Benchmarking, the research objectives of the study is confined to:

- a) to evaluate the adherence of process steps in each of the phases of NPI framework;
- b) to identify and verify metrics in each of the phase of the NPI framework;
- c) to identify VOC and VOB characteristics and verify whether those are met in each of the phases;
- d) to plan and build prototype of the new model of trucks and evaluate the performance of the truck(s);
- e) to plan and build pilot machines of the new model of trucks and evaluate the performance of pilot validation in the customer mines sites;
- f) to carry out Production Studies of the new model of trucks with the competitor machines and generate Production Study data to substantiate the advantages of the new trucks over the competitors;
- g) to verify the readiness deliverables in all functions for the successful New Product Production Launch and
- h) To document lessons learnt and create scope for further improvements in the future programs.

6. Research Methodology

Research Design

In the present study, descriptive design was followed. Singh (1980) defined descriptive research as a design to explain the characteristics of the variables as it is. In business research we quite often use the term *Ex post facto* research for descriptive research studies. The main characteristic of this method is that the researcher has no control over the variables; he can only report what has happened or what is happening. The methods of research utilized in descriptive research are survey or study methods of all kinds, including comparative and correlational methods. In the present study, it is related to the adherence of the New Production Introduction process and the results of the production studies to place the new product in the market. It is based on predetermined objectives and methodology. In the process of study, the objectives are pre-determined. The methodology has been designed to fulfill the objectives for the study.

Framework of Analysis

The following NPI tools were used to verify the NPI process discipline, analyze proto and pilot build data, setting and following the timeline, conduct production studies.

- 1) NPI Workflow
- 2) NPI Dashboard
- 3) Process Conformance Index

- 4) Requirements Management Index
- 5) APQP Conformance Index
- 6) Project Management
- 7) VET Analysis
- 8) Production Study
- 9) PPRD Analysis
- 10) Reflection Analysis

7. Summary of the Findings

The present study concludes on the successful introduction of 40/50T Off-Highway Trucks to the Growth Markets. The study provides benefits of following the rigorous NPI Process. The study details on the Voice of the Customer (VOC) and Voice of the Business (VOB) analysis carried out upfront before starting the NPI program, as mentioned in Figure 7.1

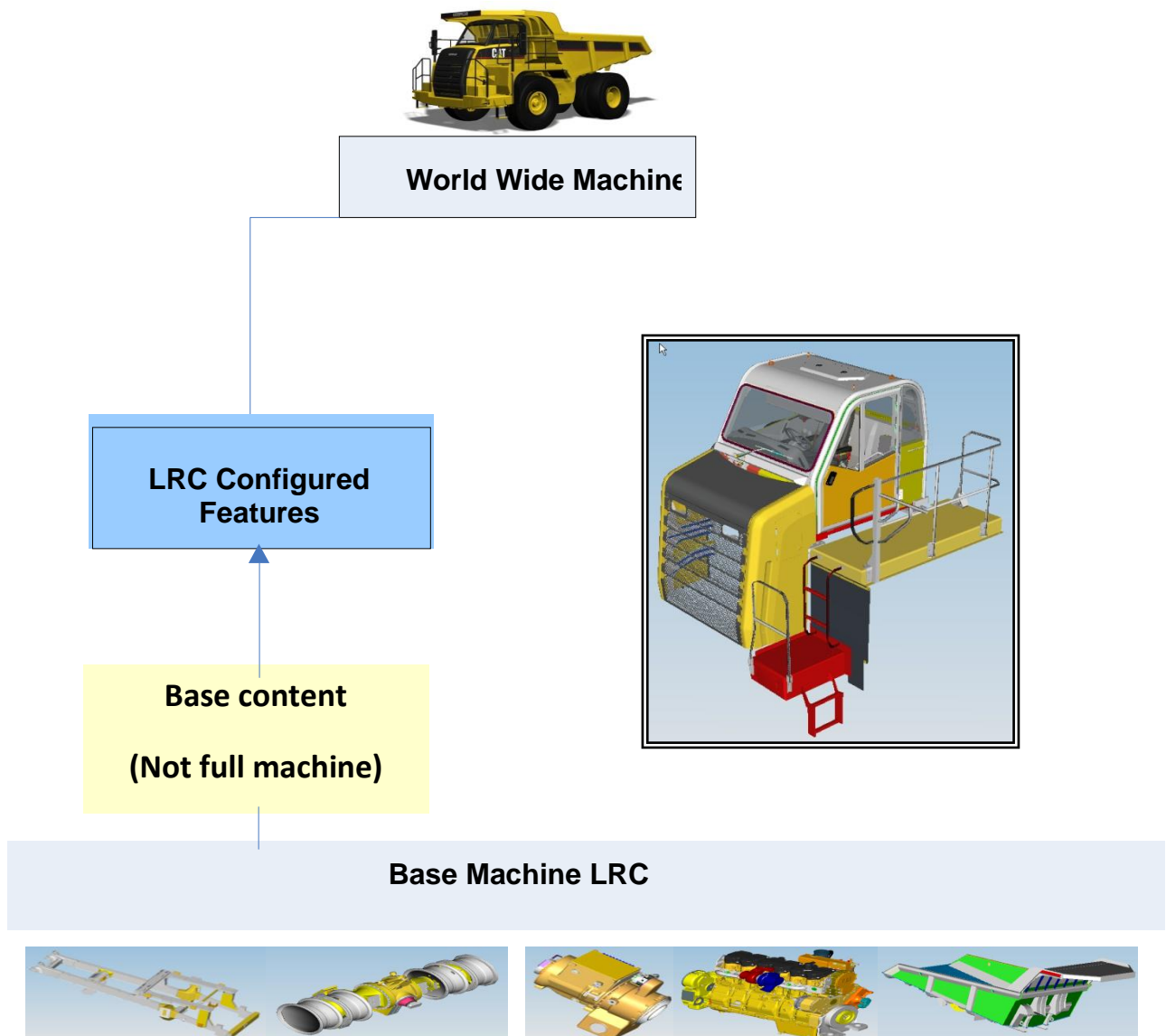
Figure 7.1 – VOC and VOB

770 / 772 Titan "X" Series	Base (Tender)	EM (Private)	Dev. Mkt.	ATT	770 / 772 Titan "X" Series	Base (Tender)	EM (Private)	Dev. Mkt.	ATT
Information Systems / Electronics					Body				
Product Link				X	Dual Slope Body	X			
Fluid Level Monitoring			X		Flat Floor Body				
Economy Mode	X	X	X		8mm Liner (must select one)				
Autoidle/Autoshutdown		X	X		12mm Liner (must select one)				
Messenger Display			X		16mm Liner (must select one)				
Advisor/CMPD Display				X	20 mm Liner (must select one)				
Tire Pressure Monitoring			X		25mm Liner (must select one)				
TKPH				X	50mm Rubber (must select one)				
Guardian				X	100mm Rubber (must select one)				
Ground Level ET Port	X	X	X		Various Sideboards				
TPMS				X	Safety				
Cab and Operator Environment					Retractable Ground Level Access System				X
Tilt Cab			X		Improved Brake Slope Holding Capabi	X			
Heated Mirrors				X	Fire Suppression Zone	X			
Power Mirror				X	Self Adjusting Back-Up Alarm (audio/v	X			
Foot rest		X	X		Performance				
Hinged & Sliding RH Window			X		ARC	X			
Power Left Window			X		Extended Life Disc Brakes	X			
Trainer Seat, Lap belt	X	X	X		Cold Weather Starter				X
Seatbelt Indicator				X	Engine Heater 120V				X
HID Lights				X	Engine Heater 240V				X
ISO 5006 Visibility Package				X	Diesel Fuel Heater				X
1 WAVS Package				X	Compression Brake				X
3 WAVS Package				X	Exhaust Body Heat Routing	X	X	X	
EU Arrangement (incl. suspension)				X	Exhaust Muffler				X
Heater				X	Exhaust Body Heat/Muffler Diverter				X
Autotemp					TCS				X
Air Conditioning				X	ECPC	X			
Double Floor				X	Advanced Shift Control		X	X	
Radio Mounting Bracket		X	X		Serviceability				
Map Light		X	X		Ingress / Egress Lights		X	X	
Cigarette Lighter		X	X		Engine Compartment Lights			X	
Deluxe Instrument Cluster		X	X		Side Work Lights			X	
Fuel Level Indicator - Cab	X	X	X		High Speed Oil Change		X	X	
					Ground Level Grease Fittings		X	X	
					Groeneveld Auto Lube Power Supply Ready		X	X	

The study rolls out the 8 phases of the Caterpillar New Product Introduction (NPI) Process and the Metrics that govern it. It also details about the elaborate tools used in the NPI Process and the benefits that arise due to following those tools.

The study unwinds the Strategy behind introducing 40/50T Off-Highway Trucks in Growth Markets and its impact on Indian Economy and Growth. Selection of features that suit Growth Markets as mentioned in Figure 7.2 and their effective utilization are clearly explained during defining the program goals.

Figure 7.2 – Design Feature Selection



The study details the prototype build and the validation carried out followed by design modifications and corrective action initiated. The study also reveals the pilot build as per the New Product Introduction Program Plan – refer Picture 7.3 and subsequent customer validation and the effectiveness of the Pre-Production Reliability Development (PPRD) tool as represented in Figure 7.4, in managing the issues and providing corrective actions.

Figure 7.3 – New Product Introduction Program Plan

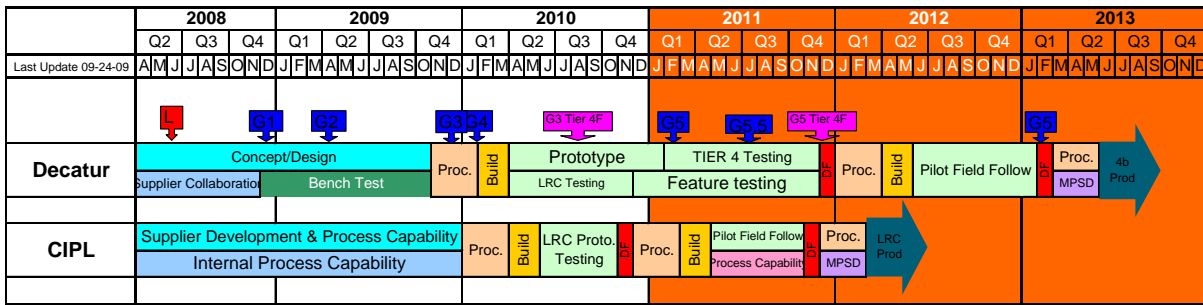
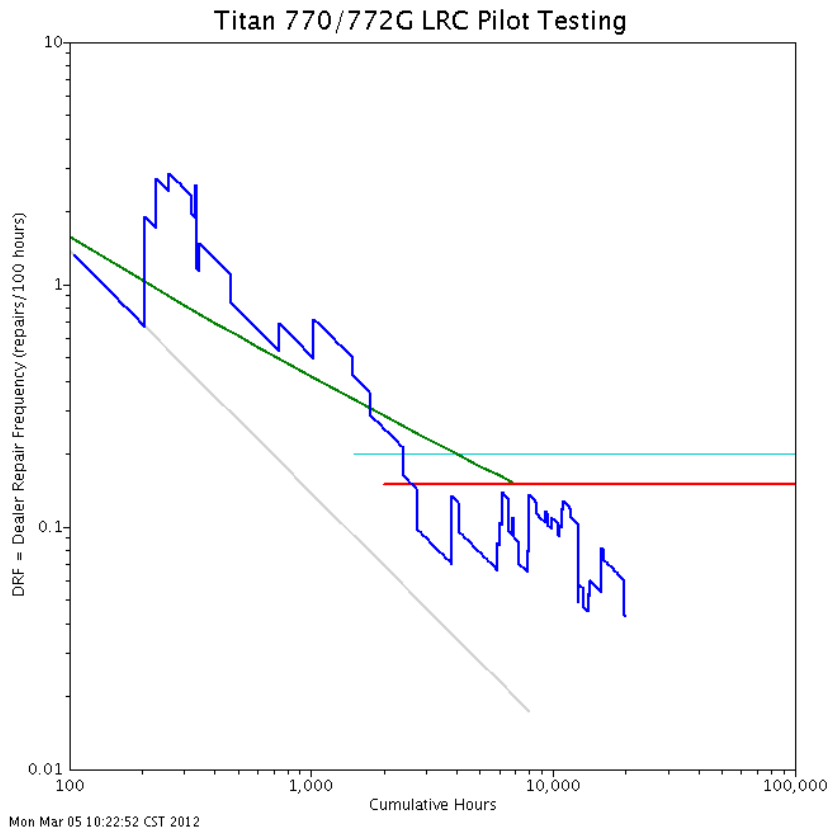


Figure 7.4 – Pilot Validation Result (Pre-production Reliability Development Tool)

Confidence = 75%	New Content = 9.50%	Growth Rate = -0.45
Target	0.1500 / 100 hrs	
Capability (Demo)	0.2000 / 100 hrs	
Predicted	0.0889 @ 19900.1 Hrs; 0.1500 @ 7,012.69 Hrs	
Demonstrated	0.0430 @ 19900.1 Hrs	
Zero Failures		



The study reveals the Value Analysis (VET Analysis) of the features incorporated in the newly introduced 40/50T Off-Highway truck model. Production studies and competitive benchmarking of 40/50T Off-Highway truck model with competitor machines of similar class provided an opportunity to validate the performance of the newly introduced products in the market and provides a story for value selling and higher returns, as depicted in Figures 7.5 and 7.6

Figure 7.5 – Value Analysis

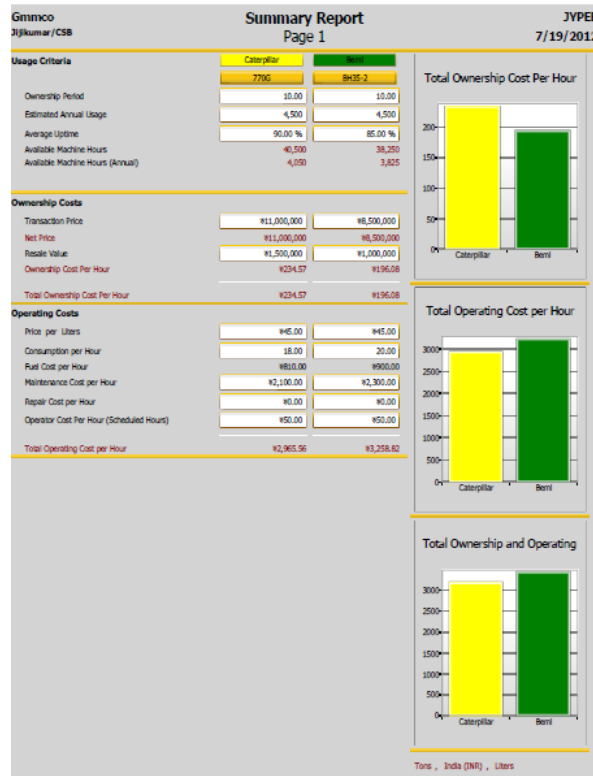


Figure 7.6 – Competitive Benchmarking



CAT 770G (40T) vs Competitor machine A

- 21% higher productivity
 - o 12% higher payload
 - o 5% faster haul time
- 3% lower fuel consumption
- 24% metric ton/litre advantage

CAT 772G (50T) vs Competitor machine B

- 12% higher productivity
 - o 12% higher payload
 - o 6% faster haul time
- 20% lower fuel consumption
- 40% metric ton/litre advantage

8. Conclusion

The study reconciles the deliverables that are needed for effective product production launch and the Reflection Analysis provides insight on the positives happened in the NPI Program and improvements that are needed as lessons learned in future programs. The results of this study determines how systematic adherence of New Product Introduction process at Caterpillar for the introduction of 40/50 ton rear dump trucks has paved way for the successful production launch of its products and how Caterpillar 40/50T products were subjected to competitive benchmarking with similar class products of competitors and emerged superior over competitors with regard to product performance and reliability.

9. Scope for the Future

The present study is the base for many studies to follow. The Reflection Analysis opens door for many research works for young scholars. The lessons learned from the New Production Introduction Process provides opportunities to look for new avenues and methodologies to improve the effectiveness of the NPI process and reduce the lead time for NPI programs. The Production Studies provide base for further studies with other competitor models and improve value selling in the growth markets. The study also provides ample opportunities for future study in effective ways of handling and managing Engineering changes and implementation. The PPRD Analysis sets up new platform for young scholars to effectively capture analyze and manage customer issues.

Abbreviations and Acronyms

APQP	: Advanced Product Quality Planning
NPI	: New Product Introduction
OEM	: Original Equipment Manufacturer
O&O	: Owning and Operating
PPRD	: Pre Production Reliability Development
TCS	: Traction Control System
VET	: Value Evaluation Technique
WW	: World Wide

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